

Langley Aerosol Research Group (LARGE)

Bruce E. Anderson, Eddie Winstead, Gao Chen, and Lee Thornhill
Atmospheric Sciences, NASA Langley Research Center, Hampton, VA
757-864-5850 (phone); 757-864-5841 (fax); bruce.e.anderson@nasa.gov

We will provide measurements of aerosol number density, volatility, size distribution and optical properties aboard the NASA DC-8 during INTEx. These measurements will be conducted in close collaboration with the University of Hawaii (Antony Clarke, PI) and will provide detailed information on ambient in-situ aerosol microphysical properties in conjunction with on-board real-time assessments of the underlying physio-chemical characteristics. This combination will provide size-resolved data that links aerosol atmospheric effects to the nature of aerosol emissions and composition. Measurements will include: 1) a set of three condensation nuclei counters to determine total aerosol number density, the number of particles between 0.003 and 0.01 μm (ultrafine CN) and the fractional volatility of aerosols $> 0.01 \mu\text{m}$ (LaRC-UH); 2) a tandem differential mobility analyzer and optical particle counter to obtain total and nonvolatile aerosol size distribution over the size range from 0.010 to 7 μm (UH); 3) an Aerodynamic Particle Sizer (APS) for mass-dependent sizing of 0.5 to 10 μm diameter particles (LaRC); 4) a pair of wing-tip mounted aerosol scattering spectrometer probes to measure, in addition to cloud liquid water content, particle size distributions at ambient humidity over the 0.3 to 1550.0 μm size-diameter range (LaRC); 5) a pair of integrating nephelometers to measure total and submicron aerosol scattering coefficients (LaRC-UH); 6) two Particle Soot Absorption Photometers (PSAPs) to record total and submicron aerosol (i.e., black carbon) absorption coefficients (LaRC) and (7) measurements of extinction vs. humidity [f(RH)] that quantifies the role of water uptake on the ambient scattering/extinction properties (UH), as detected by remote sensing. Sample air will be provided to the cabin-mounted instruments via the University of Hawaii shrouded inlet probe that was evaluated during the DC-8 Inlet Characterization Experiment (DICE) and found to efficiently transmit particles $< 4 \mu\text{m}$ dry diameter over the entire performance envelope of the aircraft. The selected instruments were successfully deployed aboard the aircraft during INTEx-NA as well as previous missions and will yield aerosol physical property measurements comparable to those being recorded aboard the NCAR C-130 aircraft that will be conducting coordinated missions with the DC-8 as part of the overall MIAGRO program. Work will include careful pre- and post-mission calibration of the instrument payload; in-flight distribution of selected signals to the DC-8 data acquisition and distribution system (ICATS) for real-time display and use in flight planning; and generation of post-flight and post-mission data products. We will also perform post-mission analyses aimed at 1) evaluating the consistency between the DC-8 aerosol measurements and data sets collected by other participating groups; 2) determining the advective flux of aerosol species from Asia to the west coast of the U.S. east coast; 3) comparing modeled aerosol microphysical properties to those observed experimentally; and 4) examining the links between aerosols and the microphysical properties of clouds.